

**CLAIMS**

1. An isolated polynucleotide encoding a RC Kinase polypeptide and being selected from the group consisting of:

5 a) a polynucleotide encoding a RC Kinase polypeptide comprising an amino acid sequence selected from the group consisting of:

amino acid sequences which are at least about 50% identical to

the amino acid sequence shown in SEQ ID NO: 7, 8, 9, 10, 11, or 12; and

the amino acid sequence shown in SEQ ID NO: 7, 8, 9, 10, 11, or 12.

b) a polynucleotide comprising the sequence of SEQ ID NO: 1, 2, 3, 4, 5, or 6;

10 c) a polynucleotide which hybridizes under stringent conditions to a polynucleotide specified in (a) and (b);

d) a polynucleotide the sequence of which deviates from the polynucleotide sequences specified in (a) to (c) due to the degeneration of the genetic code; and

e) a polynucleotide which represents a fragment, derivative or allelic variation of a 15 polynucleotide sequence specified in (a) to (d).

2. An expression vector containing any polynucleotide of claim 1.

3. A host cell containing the expression vector of claim 2.

4. A substantially purified RC Kinase polypeptide encoded by a polynucleotide of claim 1.

5. A method for producing a RC Kinase polypeptide, wherein the method comprises the 20 following steps:

a) culturing the host cell of claim 3 under conditions suitable for the expression of the RC Kinase polypeptide; and

b) recovering the RC Kinase polypeptide from the host cell culture.

6. A method for detection of a polynucleotide encoding a RC Kinase polypeptide in a 25 biological sample comprising the following steps:

a) hybridizing any polynucleotide of claim 1 to a nucleic acid material of a biological sample, thereby forming a hybridization complex; and

b) detecting said hybridization complex.

7. The method of claim 6, wherein before hybridization, the nucleic acid material of the biological sample is amplified.

8. A method for the detection of a polynucleotide of claim 1 or a RC Kinase polypeptide of claim 4 comprising the steps of:

contacting a biological sample with a reagent which specifically interacts with the polynucleotide or the RC Kinase polypeptide.

10 9. A diagnostic kit for conducting the method of any one of claims 6 to 8.

10. A method of screening for agents which decrease the activity of a RC Kinase, comprising the steps of:

contacting a test compound with any RC Kinase polypeptide encoded by any polynucleotide of claim 1;

15 detecting binding of the test compound to the RC Kinase polypeptide, wherein a test compound which binds to the polypeptide is identified as a potential therapeutic agent for decreasing the activity of a RC Kinase.

11. A method of screening for agents which regulate the activity of a RC Kinase, comprising the steps of:

20 contacting a test compound with a RC Kinase polypeptide encoded by any polynucleotide of claim 1; and

detecting a RC Kinase activity of the polypeptide, wherein a test compound which increases the RC Kinase activity is identified as a potential therapeutic agent for increasing the activity of the RC Kinase, and wherein a test compound which decreases the RC Kinase activity of the polypeptide is identified as a potential therapeutic agent for decreasing the activity of the RC Kinase.

25 12. A method of screening for agents which regulate the activity of a RC Kinase, comprising the steps of:

contacting a test compound with a RC Kinase polypeptide encoded by any polynucleotide of claim 1 and MKK4; and

detecting a RC Kinase activity of the polypeptide to phosphorylate MKK4, wherein a test compound which increases the RC Kinase activity is identified as a potential therapeutic agent for increasing the activity of the RC Kinase, and wherein a test compound which decreases the RC Kinase activity of the polypeptide is identified as a potential therapeutic agent for decreasing the activity of the RC Kinase.

- 5 13. A method of screening for agents which decrease the activity of a RC Kinase, comprising the steps of:

10 contacting a test compound with any polynucleotide of claim 1 and detecting binding of the test compound to the polynucleotide, wherein a test compound which binds to the polynucleotide is identified as a potential therapeutic agent for decreasing the activity of RC Kinase.

14. A method of reducing the activity of RC Kinase, comprising the steps of:

15 contacting a cell with a reagent which specifically binds to any polynucleotide of claim 1 or any RC Kinase polypeptide of claim 4, whereby the activity of RC Kinase is reduced.

15. A reagent that modulates the activity of a RC Kinase polypeptide or a polynucleotide wherein said reagent is identified by the method of any of the claim 10 to 12.

16. A pharmaceutical composition, comprising:

20 the expression vector of claim 2 or the reagent of claim 14 and a pharmaceutically acceptable carrier.

17. Use of the pharmaceutical composition of claim 15 for modulating the activity of a RC Kinase in a disease.

25 18. Use of claim 17, wherein the disease is chronic obstructive pulmonary disease, cancer, or a disease in which cell signaling is defective.

19. A method for the prediction, diagnosis or prognosis of respiratory diseases by the detection of expression level of the RC KINASE gene or genomic nucleic acid sequences.

20. The method of claim 19 wherein the respiratory disease is chronic obstructive pulmonary disease, cancer, or a disease in which cell signaling is defective.

21. The method of claim 19 or 20 wherein the detection method comprises the use of PCR, arrays or beads.
22. A method for the prediction, diagnosis or prognosis of COPD by the detection of at least one marker characterized in that at least one marker is selected from:
- 5       a) a polynucleotide or polynucleotide analog comprising the sequences of SEQ ID NO: 1, 2, 3, 4, 5, or 6;
- 10      b) a polynucleotide or polynucleotide analog which hybridizes under stringent conditions to a polynucleotide specified in (a) and encodes a polypeptide exhibiting the same biological function as RC KINASE;
- 15      c) a polynucleotide or polynucleotide analog, the sequence of which deviates from the polynucleotide specified in (a) and (b) due to the degeneracy of the genetic code, encoding a polypeptide exhibiting the same biological function as RC KINASE;
- 20      d) a polynucleotide or polynucleotide analog which represents a specific fragment, derivative or allelic variation of a polynucleotide sequence specified in (a) to (c) encoding a polypeptide exhibiting the same biological function as RC KINASE;
- e) a purified polypeptide encoded by a polynucleotide or polynucleotide analog sequence specified in (a) to (d);
- f) a purified polypeptide comprising at least one of the sequences of SEQ ID NO: 7, 8, 9, 10, 11, or 12;
- are detected.
23. A method for the prediction, diagnosis or prognosis of COPD by the detection of at least 2 markers characterized in that at least 2 markers are selected from:
- 25      a) a polynucleotide or polynucleotide analog comprising the sequence of SEQ ID NO:1, 2, 3, 4, 5, or 6;
- b) a polynucleotide or polynucleotide analog which hybridizes under stringent conditions to a polynucleotide specified in (a) and encodes a polypeptide exhibiting the same biological function as RC KINASE;

- c) a polynucleotide or polynucleotide analog the sequence of which deviates from the polynucleotide specified in (a) and (b) due to the generation of the genetic code encoding a polypeptide exhibiting the same biological function as RC KINASE;
- d) a polynucleotide or polynucleotide analog which represents a specific fragment, derivative or allelic variation of a polynucleotide sequence specified in (a) to (c) encoding a polypeptide exhibiting the same biological function as RC KINASE;
- e) a purified polypeptide encoded by a polynucleotide sequence or polynucleotide analog specified in (a) to (d);
- f) a purified polypeptide comprising the sequence of SEQ ID NO:7, 8, 9, 10, 11, or 12;

are detected.

- 24. A diagnostic kit for conducting the method of anyone of claims 19 to 23.
- 25. A composition for the prediction, diagnosis or prognosis of COPD comprising:
  - a) a detection agent for:
    - i. a polynucleotide or polynucleotide analog comprising at least one of the sequence of SEQ ID NO: 1, 2, 3, 4, 5, or 6;
    - ii. any polynucleotide or polynucleotide analog which hybridizes under stringent conditions to a polynucleotide specified in (i) encoding a polypeptide exhibiting the same biological function as RC KINASE;
    - iii. a polynucleotide or polynucleotide analog the sequence of which deviates from the polynucleotide specified in (i) and (ii) due to the degeneracy of the genetic code encoding a polypeptide exhibiting the same biological function as RC KINASE;
    - iv. a polynucleotide or polynucleotide analog which represents a specific fragment, derivative or allelic variation of a polynucleotide sequence specified in (i) to (iii) encoding a polypeptide exhibiting the same biological function as RC KINASE;
    - v. a polypeptide encoded by a polynucleotide or polynucleotide analog sequence specified in (i) to (iv);

- vi. a polypeptide comprising at least one of the sequences of SEQ ID NO: 7, 8, 9, 10, 11, or 12.

Or

- b) at least 2 detection agents for at least 2 markers selected from:
- 5 i. any polynucleotide comprising at least one of the sequences of SEQ ID NO: 1, 2, 3, 4, 5, or 6;
- ii. any polynucleotide which hybridizes under stringent conditions to a polynucleotide specified in (i) encoding a polypeptide exhibiting the same biological function as RC KINASE;
- 10 iii. a polynucleotide the sequence of which deviates from the polynucleotide specified in (i) and (ii) due to the degeneracy of the genetic code encoding a polypeptide exhibiting the same biological function as RC KINASE;
- iv. a polynucleotide which represents a specific fragment, derivative or allelic variation of a polynucleotide sequence specified in (i) to (iii) encoding a polypeptide exhibiting the same biological function as RC KINASE;
- 15 v. a polypeptide encoded by a polynucleotide sequence specified in (i) to (iv);
- vi. a polypeptide comprising at least one of the sequences of SEQ ID NO: 7, 8, 9, 10, 11, or 12.
- 20 26. An array comprising a plurality of polynucleotides or polynucleotide analogs wherein each of the polynucleotides is selected from:
- a) a polynucleotide or polynucleotide analog comprising at least one of the sequences of SEQ ID NO: 1;
- 25 b) a polynucleotide or polynucleotide analog which hybridizes under stringent conditions to a polynucleotide specified in (a) encoding a polypeptide exhibiting the same biological function as RC KINASE;
- c) a polynucleotide or polynucleotide analog the sequence of which deviates from the polynucleotide specified in (a) and (b) due to the degeneracy of the genetic

code encoding a polypeptide exhibiting the same biological function as RC KINASE;

- d) a polynucleotide or polynucleotide analog which represents a specific fragment, derivative or allelic variation of a polynucleotide sequence specified in (a) to (c) 5 encoding a polypeptide exhibiting the same biological function as RC KINASE;

attached to a solid support.